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COMPUTERS AND AUTOMATION

CYBERNETICS · ROBOTS · AUTOMATIC CONTROL

Vol. 2, No. 6

The Soviet Union: Automatic Digital Computer Research
... Tommaso Fortuna

Digital Computer Questionnaire
... Lawrence Wainwright

"How to Talk About Computers" — Discussion
... G.G. Hawley, Samuel A. Scharff,
C.B. Crumb, Jr. and E.C. Berkeley

SEPTEMBER, 1953

THE EDITOR'S OFFICE

Responses. One of the things continually needed by any magazine (and by many other enterprises) is feedback -- responses from its public. The cards we have inserted in the last few issues have had several drawbacks. In this issue, after a long discussion with the U. S. Post Office about its regulations and what they permit, we have adopted a "business reply label". See page 33. We hope it may be of assistance to you.

Cumulative Roster. In either the October or the November issue, we expect to print again in full the "Roster of Organizations in the Field of Computers and Automation". If you have any changes to suggest in the listing of any companies for which you have information, please send them in to us. A report form is on page 15.

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Back Copies. Issues October, 1952, to date are available. Price $1.25 each; or a subscription may be specified to begin with a stated issue. See more information on page 31.

Manuscripts. We desire to publish articles that are factual, useful, understandable, and interesting to many kinds of people engaged in one part or another of the field of computers and automation. In this audience are many people who have expert knowledge of some part of the field, but who are laymen in other parts of it. Consequently, a writer should seek to explain his subject, and show its context and significance. He should define unfamiliar terms, or use them in a way that makes their meaning unmistakable. He should identify unfamiliar persons with a few words. He should use examples, comparisons, analogies, etc., whenever they may help readers to understand a difficult point. He should give data supporting his argument and evidence for his assertions. An article may certainly be controversial if the subject is discussed reasonably.

Ordinarily, the length should be 1000 to 4000 words, and payment will be $10 to $50 on acceptance. A suggestion for an article should be submitted to us before too much work is done. To be considered for any particular issue, the manuscript should be in our hands by the first of the preceding month.

COMPUTERS AND AUTOMATION

Vol. 2, No. 6 September, 1953

ARTICLES Page

The Soviet Union: Automatic Digital Computer Research 1
by Tommaso Fortuna

Digital Computer Questionnaire 3
by Lawrence Wainwright

"How to Talk About Computers" - Discussion 9
by G.G. Hawley, Samuel A. Scharff,
C.B. Crumb, Jr., and E.C. Berkeley

REFERENCE INFORMATION

Books and Other Publications 8

Roster of Organizations in the Field of Computers and Automation 13
(supplement)

Roster of Organizations Making Components 16

Patents 17

Who's Who: Section 3 — Not Programming, Not Business 19
(cumulative, L to R)

DEPARTMENTS

The Editor's Office i

Advertising 26

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THE SOVIET UNION: AUTOMATIC DIGITAL COMPUTER RESEARCH

by Tommaso Fortuna, Milan, Italy

(The following article is the first of several articles on activity in automatic digital computers in the Soviet Union and in other countries. The main purpose of these articles is to assist engineers in evaluating technical reports coming from other countries).

Many engineers in the field of automatic digital computers today have had occasion to refer to various technical reports emanating from the Soviet Union, and have been astonished by the elegance of mathematical analysis in such works as those of P. L. Chebyshev in the Chebyshev economization, M. B. Osttrogradskii in the theory of topological sets, and I. M. Vinogradov in fields ranging through all the aspects of mathematical applications of large computers. There are obvious implications of advances in digital computer research in the Soviet Union in such articles as those of A. N. Kolmogorov in gunnery, V. L. Goncharov on probabilities, Sergei Bernstein on randomness, V. L. Kantorovich on Gaussian Transformations; and these implications have not gone unnoticed by scientists of other nations. Recently a committee of German specialists met in Darmstadt in order to analyze the true meaning of the extension of certain tables published in the Soviet Union, which tables could not possibly have been computed by hand. Every new computer conference in Europe brings new information on developments inside Russia. We may safely add the Soviet Union to the growing list of nations possessing important capacities in automatic large-scale computers.

The main difficulty in reading Soviet literature is the problem of authoritativeness. This same problem applies to all technical papers originating from areas where there is little or no possibility of verifying the scientific stature of the authors of the papers. It is clear that papers received from such an area cannot in general be reviewed by any limited circle of good scientists and evaluated for their net worth or contribution to science, for this obligation would overload such scientists with information-screening assignments. Yet a methodical and continual analysis of all authoritative activities in any country should help researchers to avoid duplication of effort.

Many Russian born engineers realize that there is a reliable method of appraising the authoritativeness of any writer in the Soviet Union. This method is based upon the internal political structure of the Soviet Union in respect to research activities. In the computing field, the top authority for basic design and research is the Academy N A U K, with headquarters in Leningrad. This academy has some twenty-eight branches located all over the Soviet Union, mostly in cities having technical universities such as Moscow, Kiev, Kasan, Vladivostok, Astrakhan, Minsk, Gorki, Dniepropetrovsk, etc. In addition to the Academy's own basic research, it is also responsible for the evaluation of foreign activities as reported in various technical periodicals. This is done by committees (Otdelenie Tekhnicheskikh Nauk). The committee especially charged with the evaluation of computer activity in the United States is located in Leningrad. It includes among others the following men: N. G. Bruevich (logical design); I. Ia. Akrushkii (business machines); L. I. Gutenmakher (electronic components); L. Liusternik (programming and logic); L. Ia. Neishuler (mathematical theory); M. L. Bykhovskii (lattice structures in reference to memory design). This committee published a report acknowledging the United States' posi-

tion as the present leader in large scale digital computers. They were also probably responsible in getting larger funds allocated for computer development in the Soviet Union than for any other technical research in that country.

As soon as the Academy N A U K has completed the basic engineering research for a project, and has determined that the project is feasible and ready for production, the project is assigned to a specific institute which is set up under a trust. A trust is a controlling body equivalent to a large government corporation; it embraces production, some research, and control in liaison with various ministries of the Soviet Union and departments of the Academy N A U K. The technical reports originating in the trust are very rarely seen inside or outside of Russia; their distribution is made only upon registered request. The institutes set up under the trusts are coordinated by the Applied Science Ministry. In the computer field the coordination results in a criss-cross pattern as follows: research in nylon tape - Institute of Applied Chemistry; research in red oxide tape emulsions - Central Institute for Ferrous Metals; research in temperature control and standards - Institute for Special Problems in Physics and Chemistry; research in flow problems - Central Aero-Hydro-Dynamic Institute; research in technical applications - Don Polytechnical Institute.

The trusts have under their jurisdiction about two hundred plants in addition to the assigned institutes. These plants are mainly concerned with actual manufacturing and production. The chief reason for assigning the computer developments to the trusts is to enable them to procure the necessary technical equipment quickly and quietly; but, in addition, a singular effort has been made to keep computer activities and knowledge thereof to a restricted group. One such group is the Institute for Applied Alternating Current Studies in Leningrad, under the direction of P. I. Zubkov. This group is building one of the world's first computers using the scale of three, the ternary system.

The major part of the Soviet effort in the computer field has gone into logical design, which is being accomplished by such groups as the V. Fok group of the Academy N A U K. There is a strong secondary emphasis on memory devices. Almost every known memory development is available for test purposes in the Soviet Union. The Soviet technical literature has referred to the Williams tube, magnetic cores, acoustic delay, and an enigmatical "lattice strip" memory. As far as information is available, the access time on the "lattice strip" memory is the slowest of all, some 10 milliseconds at the fastest.

One of the tragedies of Soviet oversensitivity to computer research and development has been the elimination of excellent research groups in Czechoslovakia and Hungary. Prague and Budapest possessed top ranking digital computer research groups before the change of government. Very discouraging information continues to be heard from these men since the change.

The actual problems solved on Soviet automatic computers include tables of elementary functions, beta and gamma functions, Bessel integrals, and solutions to problems in the theory of numbers such as prime roots, arrays, transcendental randomness, etc.

It appears that a costly and ever increasing loss to Soviet research activities is the elimination of comments and criticisms from the world scientific body on their more detailed technical articles. Cooperation with other scientists would, as nothing else can, separate the wheat from the chaff, and would save them time and expense on already tested futile paths.

DIGITAL COMPUTER QUESTIONNAIRE

by Lawrence Wainwright, Consultant, Del Mar, California

The following questionnaire is an attempt to compile a comprehensive and searching list of questions which a prospective customer may wish to ask a potential supplier of an automatic digital computer.

The questionnaire is too comprehensive for use all in the first stage. It is probable that a new customer, on first exploring the field, will select some characteristics of a computer installation which are most important to him (perhaps cost, capacity, speed, etc.) and ask the corresponding questions of all the potential suppliers of whom he has knowledge. The answers to this first inquiry should serve to reduce the number of potential sources to relatively few. These few might then be asked a longer list of questions which would result in only one or two final contenders. The complete information required could then be obtained from the final contenders, perhaps during visits to their plants. In any event, before a final decision is made, the complete questionnaire might well be reviewed to insure that all important information has been obtained.

It is hoped that the questionnaire will serve to alert customers to some aspects of the procurement problem which might otherwise not receive timely attention.

General Description

Photographs, sketches, description?

Locations of factory, service centers, spare parts stocks?

Parts: Memory; rapid, intermediate, slow, special registers - all under program control? Transfer means? Arithmetic unit? Control unit? Input means? Output means? Other means or units?

Functional Design

General: Are instructions and data interchangeably stored in all memories? What are functional diagrams? overall? by parts? Is internal operation in binary, decimal, or what? Is operation parallel or serial, by parts? What is structure of machine word and information content, for instructions and for data, including fixed or floating point? What automatic checking features are provided, where and how, what indications of discrepancies and what action?

Memory: What are type and size (no. registers) of rapid memory (electrostatic or equivalent)? What are type and size (no. registers) of intermediate memory (magnetic drum or equivalent)? are individual registers addressed or is addressing by blocks? What are type and size (no. registers) of slow memory (magnetic tape or equivalent) under program control? how is it addressed (by register or by block of what structure)? does it serve dual purposes (memory and input-output) and, if so, how? What are type, structure, operation, and control of any special registers?

Transfer means: What transfer channels are available? how do they operate? and what preclusions occur (such as transfer between memory sections precluding multiplication)?

or cannot proceed, wholly or partly, at the same time as others? how are preclusions handled by means of programming? What are modes of operation (normal, step-by-step, reduced rate, etc.)? What is operator's manual if available? What are characteristics of any special cards, tapes, printed forms, etc., required?

Abnormal operation (trouble-shooting): What are indications and effects (machine stops, record is made, etc.) of faulty action by operator, program error, or defective data? What devices are provided to assist operator in identifying, localizing, and correcting abnormal operation?

Programming: What are instructions, forms, devices, procedures available to assist programming? What is the list of the library of subroutines (mathematical, business, diagnostic, interpretive, checking, etc.) available? What are their defining characteristics (purpose, range of values, etc.)? What is their form (cards, tape, etc.)? What is their source? What are any compiling routines available and their use, with list of those available and examples of application? What is method of double precision operation? What is reduction factor in operating speed? What are any programming consulting services available?

Problem types: What is the list of types of problems which an installation: (1) is well suited to handle; (2) can handle? What is a sample problem? What is its program in full (involving not less than the equivalent of 100 single-address operations)? What are the total times for: (1) program preparation; (2) program input; (3) data input; (4) internal operation; and (5) data output (printing or equivalent form)?

Acceptance tests: Have any acceptance tests of any part or the whole of the proposed installation, its predecessors or prototypes, been held? where? by whom? how? What are proposed conditions for acceptance for this installation?

Customer training: What training is available for customer's operators? number of persons? length of course? location? etc.

Engineering design

General: By cabinets or major divisions (including input-output devices, auxiliaries, test devices, and maintenance and stock facilities), what are outline sketches? What are floor and elevation plans with dimensions, weights, power requirements, cabling and ducting requirements (including under-floor or special overhead spaces)? any unusual installation requirements, as to building access by doors or elevators? What is proposed general arrangement plan? What are details as to cooling system furnished with installation or required of building, specifying units of cooling, heat, or power? What are any environmental requirements, such as temperature or humidity limits, or other? What are power requirements, including all parts, auxiliaries, and internal or building cooling? What provisions are made or recommended to minimize effects of power failure, especially as regards volatile memory?

Components and parts: What are types of tubes, crystal diodes, and similar critical items? name of maker; number used? whether special production or percentage of selection from regular production, significant inspection and preconditioning procedures, de-rating factors, and life experience in computer use? What JAN (Joint Army Navy) or other recognized specifications are followed? If input or output means are purchased, what are name and location of supplier? What are available engineering design information? To what extent have chassis sections or similar sections been standardized?

Arithmetic unit: What operations can the arithmetic unit perform? and how?

Control unit: What are characteristics of the control unit? how does it function?

Input means: What methods of input are supplied, available, or adaptable? what are the principles of operation? what are the characteristics of the medium (card, tape, etc.)? what is the code structure of each? by whom is each made? To what extent is each means under program control? For each input channel, what internal operations are precluded during part or all of input operation? What machine registers can be associated directly with input means for rapid (real time) operation? Are means provided for input code conversion (as from decimal to binary)? or is the whole computer required to be used on the subroutine for conversion?

Output means: What methods of output are supplied, available or adaptable? what are the principles of operation? characteristics of medium (card, tape, etc.)? code structure of each? To what extent is each means under program control? For each output channel, what internal operations are precluded during part or all of output operation? What machine registers can be associated directly with output means for rapid (real time) operations? Are means provided for output code conversion (as from decimal to binary) or is the whole computer required to be used on the subroutine for conversion?

Programming: If program is limited, to how many steps? of what kinds? What is complete order code? is there room for additional orders? Any branch orders? repeat orders? special orders? and what is method of cycle counting? What provision is there for floating-address operation? What means are provided to facilitate condensed (or forced) programming? Are any special means provided to facilitate double precision operation, mathematical or business routines, diagnostic, interpretive, post-mortem, or checking routines, compiling routines?

Timing: What are precise times (in microseconds, milliseconds, etc., as appropriate) for the following: Access to registers of each type? Transfer between all types of registers? Perform each type of operation in the arithmetic unit itself? Perform each type of operation by the control unit, including input-output control? Perform each step (start, stop, read, write, etc.) for all modes of operation of each type of input means? Perform each step (start, stop, read, write, etc.) for all modes of operation of each type of output means? Insert a new program of 1000 steps? shift between programs already in memory (for each useful combination)? -- What precise times are gained or lost in each of the foregoing, where applicable due to anticipation, overlap, or special machine features? What is 1/10 of the precise time (in microseconds, etc.) to perform 1 complete multiplication and 9 complete additions, each operation to include the obtaining of the order and address or addresses from the memory, obtaining the operands from the memory, performing the control functions and the arithmetical operations, and storing the result in the memory? (Note: This is a useful "average operation time"). What are the relative operating speeds among internal units? how do input-output speeds compare with internal speed? What is the length of major and minor cycles (fixed, or variable between what limits)?

Functional Operation

Normal operation: What are diagrams and descriptions of controls, indicators, monitor devices, program progress counter, etc., for computer, input-output means, and operating auxiliaries? What are flow charts for instructions, data, indications, etc.? What is the interlocking of operations, i.e., what are operations which can

Magnetic tapes: What is description of magnetic tape units? name and location of supplier? diagrams, photographs? What is the pulse pattern, with dimensions and levels (including sprocket and checking channels)? Do tapes serve dual function, i.e., input-output and memory? How is tape program-controlled? how does its operation overlap or preclude other operations? What are times and distances to start, reach operating speeds, and stop? What are maximum and average hunting, reading, writing and erasing speeds? do these apply both forward and backward? What type of tape is used? what are its dimensions? How is tape inspected and pre-conditioned? what is experience as to defects? what are remedy procedures? what is life expectancy of tape?

Storage details: If cathode-ray tubes are used, what are constructional and operational details (voltage, read-around ratio, etc.)? If magnetic flip-flop or equivalent storage is used, what are constructional and operational details (core types, switching, restoration if required, etc.)? If a magnetic drum is used, what are details as to construction and operation (size, speed, number and type of heads, pulse pattern, etc.)?

Equipment and operation: What means and indicators are furnished to verify operation and assist in trouble finding? What means and procedures are provided for preventive maintenance? Where is marginal checking provided and how is it done? What are acceptable voltage variations for proper operation? What reductions of cathode emission are acceptable for proper operation? What variations of basic pulse rate or equivalent parameters are acceptable for proper operation? What special test equipment and procedures are provided for regular maintenance?

Engineering Operation

Personnel: What are requirements for maintenance personnel as to numbers (shifts), education, training, etc.? What provisions can be made for training customer's personnel (numbers, prerequisites, where, how long, etc.)? What is proposed as to maintenance by supplier?

Operation: What is operating experience with proposed or equivalent equipment? What is customer experience? can records of experience be made available? What records are there (especially customer) giving "operating ratio", i.e., ratio of the time that the equipment operates correctly (excluding operator or program errors) to the time it is scheduled to operate (excluding reasonable scheduled maintenance time)? what is considered reasonable scheduled maintenance time? What is operating experience with auxiliary equipment? What is operating experience with magnetic tape and tape drives? What is experience of failures for major and critical units? What are possibilities of program sequences that may cause malfunction? What constitutes a standard set of spare parts? how is it replenished? from what location? What marginal checking routines have been established? where and how are they applied?

Instructions: What is maintenance operating manual? What circuit diagrams and other drawings or charts are provided for maintenance use? What is description of monitoring devices? diagrams, operation? What are the instructions for using test equipment? What are the procedures for maintenance of components?

Supply

Source and delivery: Where are factories and distributing points for major parts?

for principal auxiliary equipment? What methods of shipment are used? when does title transfer to the customer? What is time from acceptance of order to delivery?

Production: How many proposed installations have been made? What are variations in prior installations? What establishments have used essentially similar installations? for what applications?

Installation requirements: What is the plan of the floor space required for all units? for prospective additions? for service and test facilities? for stockroom, office or other space? What are any requirements for under-floor spaces, ducting, cabling spaces? What are requirements for ceiling height? What is floor loading? Are there special requirements as to door size or elevator size to permit access by large or heavy units? Who supplies ducting, cabling, and cooling equipment (both as part of equipment and to augment building facilities)? Are there any special environmental requirements (such as humidity limits, cooling water limits)? What are the details of power supply requirements (KVA, phases, voltages, variations, etc.)?

Personnel: How many operators are required (for 1, 2, or 3 shifts)? What sources of trained operators are there? Will the supplier contract to furnish trained operators? How many maintenance men are required (for 1, 2, 3 shifts; casual)? of what grades? What sources of trained maintenance men are there? Will the supplier contract to furnish trained maintenance men? Will the supplier contract to provide maintenance? What are the requirements for maintaining operator crews and maintenance crews, such as living accommodations, personal services, allowances, etc.?

Cost

Price and terms: What are the prices and payment terms for: (1) major machine, by parts, if separable; (2) auxiliaries; (3) spare parts; (4) supplies; (5) added units purchased later; (6) test equipment; (7) manuals, charts, drawings, etc.; (8) units of power, including operating, cooling, lighting, and any other; (9) complete installation costs including modification or additional facilities for building where installed; (10) acceptance test costs? What are the amounts and terms for rental of any items listed above, where applicable? What are effects of: operating more than one shift, minimum rental period, any removal charges, and times when rents start and stop? What rebate on price or reduction of rental is provided in case operating ratio falls below contract minimum?

Services: What are costs and terms for maintenance by supplier, including spares? What are costs and terms for operation by supplier (for 1, 2, or 3 shifts)? What are costs and terms (including location, duration, living accommodations, and prerequisite education or training) for supplier to train customer's personnel in operation or maintenance? What are costs and terms for supplier to furnish consulting services in problem analysis and program preparation? What are program library items available, and their costs and terms?

(Editor's Note: The original questionnaire, double-line-spaced, with each question numbered and entered on a separate line, covers 12 pages. For a copy of the original, which is likely to be more convenient in actual use, address request to the author, Dr. Lawrence Wainwright, Box 757, Delmar, California, enclosing 60 cents.)

BOOKS AND OTHER PUBLICATIONS
(List 5: COMPUTERS AND AUTOMATION, vol. 2, no. 6, September, 1953)

This is a list of books, articles, periodicals, and other publications which have a significant relation to computers and automation and which have come to our attention. We shall be glad to report other information in future lists, if a review copy is sent to us. The plan of each entry is: author or editor / title /publisher or issuer / date, publication process, number of pages, price or its equivalent / a few comments. If you write to a publisher or issuer, we would appreciate your mentioning the listing in COMPUTERS AND AUTOMATION.

1. Bross, Irwin D.J. / Design for Decision / The Macmillan Co., 60 5th Ave., New York 11, N.Y. / Sept. 1953, printed, about 300 pp, $4 *A
   The author is Statistical Consultant, Dept. of Public Health and Preventive Medicine, Cornell University Medical College, New York. The book discusses in a fresh, easy and interesting style, with examples and applications, the nature of decision, prediction, probability, values, etc. He says "The process of selecting one action from a number of alternative courses is what I shall mean by decision ... I shall try ... to describe and explain a recently developed method for making decisions which has been called statistical decision."

2. Davis, M.E., and others / Supplement to the September 1952 Report of the Society of Actuaries Committee on New Recording Means and Computing Devices / Society of Actuaries, 208 So. LaSalle St., Chicago, Ill. / June 1953, photooffset, 4 pp, perhaps free
   This reports several actual demonstrations (with the evidence) of processing life insurance company records on an automatic electronic computer using magnetic tape. The speed of one demonstration was at an effective rate of about 100,000 policies per hour. Also reports an actual demonstration of photoelectric, facsimile scanning of printed records, to produce printed premium notices at the rate of about 1700 per hour.

3. Hosken, James C. / Digital Recorder for Analog Data (paper presented at the National Telemetering Conference, Chicago, May 1953) / Arthur D. Little, Inc., Memorial Drive, Cambridge 39, Mass. / 1953, photooffset, 11 pp, limited distribution
   Considers the specification of an analog-to-digital converter, and the matching of the amount of information in the input and the output, as well as the design of the Adrad (the company's converter).

4. Talucci, D.A., Editor, and others / The Punched Card Annual, Volume Two, 1953-54/ The Punched Card Publishing Co., 509 Francis Palms Bldg., Detroit 1, Mich. / 1953, printed on coated paper, illustrated, 208 pp, $6
   Contains about 80 short articles and reports, about 40 of them with stated authors (John E. Parker, John S. Coleman, etc.). Sample titles are "Electronics for the Office", "Punched Card Plan for Wholesale Drug Distributors", "Tape Produces Tabulating Cards Automatically", "Mail Addressing with Accounting Machines", "Obtaining Three Totals with One Set of Accumulators", etc.

"HOW TO TALK ABOUT COMPUTERS" -- DISCUSSION

I. By G. G. Hawley, Executive Editor, Reinhold Book Division, New York

The interesting article by Rudolf Flesch in the July issue of "Computers and Automation" raises some questions that are perhaps more academic than practical. Whether computing machines actually think, or whether they just seem to think, is hardly a discussion that is likely to set the world by the ears. None the less, there are one or two considerations that might be mentioned by way of expanding Mr. Flesch's comments.

My opinion is that of a layman who has no special training in either mathematics or psychology and therefore should not be rated in the "expert" class. I believe that the essential point that confronts us in trying to decide the question of the "thought" processes of computers (and for that matter of any type of self-activating machine) involves the degree or order of magnitude of the process. Psychologists understand pretty well how the brain works; and there is no doubt that, together with the less highly specialized parts of the body, it operates like a machine -- an organic machine, in which neurons and electrochemical reactions take the place of relays, circuits, and magnetized tapes. That being the case, the assembly of a "thinking machine" that largely duplicates the essential functions of the brain is not particularly mysterious.

The question then becomes whether or not a computer exercises, or can be made to exercise, all the functions usually embraced by the word "think". Some of these are the day-to-day, almost automatic reactions that most of us call habit -- indeed many of them are carried on in the subconscious. These low-order mental processes -- such as drinking a glass of water when thirsty, tying one's shoes, or taking a bath -- are certainly different in degree from the conceptual type of thought, which involves using the imagination, having ideas, organizing and evaluating imponderables, etc. In the same way, the mental processes of a mouse are of a lower order of magnitude than those of a genius. Admittedly, these are the two extreme poles of mental activity, and it is not suggested that electromechanical processes are invariably of such low order. The use of these extremes merely points up the question whether the difference is one of degree only.

To put it more clearly, the two intensities or orders of thought may be indicated by the operations listed below. There is no denying that those in the right-hand column are of a different degree from those in the left-hand column. Are they also of a different kind — that is, are they just a larger, more elaborate mechanism working on the "and....and....and" principle, or is some more complex, nonreproducible entity involved?

Low order (automatic)	High order (creative-synthetic)
Eye blink	Write poem
Sneeze	Compose music
Dress and undress	Solve mathematics problem
Step up or down	Prepare law case
Retract hand from closing door	Plan research program
Reach for dropped object	Make scientific discovery

The distinction between these two orders of thought has been made in the past by several of the world's greatest philosophers and artists. Kant drew a sharp line between analytical and synthetic judgments, which might be represented as reason (r) and Reason (R); he proved — or thought he proved — that the very nature of knowledge lies in the unique ability of the mind to arrive at a positive conclusion without having to experience the results of an action every time it is performed, i.e., we know that an object will always fall if dropped, without dropping it. Coleridge (doubtless influenced by Kant) distinguished between Fancy (r) and Imagination (R), and referred to the former as "that false, secondary power by which we multiply distinctions". Descartes believed that the essence of the thinking process lies in the ability to doubt. But it could be argued that an electronic controller "doubts" when it is "hunting"!

These are complicated matters regarding which it is probable that no completely satisfying answer is at present possible. Perhaps, as Mr. Flesch suggests, it may well depend on the type of personality one has.

II. By Samuel A. Scharff, Consultant, New York

I enjoyed Mr. Flesch's discussion of the dangers of the use of the word "think" in connection with computers. His conclusions express the results of my experience. But it seems to me that in omitting a longer discussion of the semantic problem Mr. Flesch left out an important supporting argument.

If my limited acquaintance with modern semantics is not leading me astray, one of its fundamental results is the demonstration that attempts to define words with other words necessarily lead, if pressed far enough, exactly to the circular process Mr. Flesch illustrates: "Thinking" is an attribute of "mind;" "mind" is something which "thinks". Have not the semanticists joined hands with the physicists and recognized that only operational or non-verbal definitions are unmistakable? If you point to an automatic computer and say, "That's a thinking machine", then your friend may disagree with you but cannot logically misunderstand you. If your friend, in turn, points to a handsome member of the other sex and says, "In my view, that's something that thinks," then is it not apparent that the two of you are likely to disagree about many attributes of thinking?

Any verbal description of a real thing or process necessarily omits important characteristics. By looking intently at an object, an observer still will not learn all its important, pertinent characteristics.

It seems to me that Mr. Flesch is right to point out that "thinking" in normal usage does not refer to things made of copper wire, glass, magnetized iron, and the rare earths. This usage strongly influences many people's "thinking" and may very well prevent them from learning useful ideas about computers. And I agree with Mr. Flesch that anthropomorphic terms should not be used in discussing computing equipment except from a spirit of irreverence and humor, or in a group where the misleading implications will be recognized and discounted. These groups by the way do not include all the people who work on computers, nor do they exclude all laymen. But it does seem to me that we should recognize a third school in connection with the "They do think -- they don't think" argument: besides the "yes" or "no" answer, another answer should be possible — "insoluble".

For the question is insoluble. In fact, I suspect it of being a nonsense question to which there is no answer -- or, more accurately, to which there are as many answers as there are sets of basic assumptions, and this means nearly as many answers as there are questioners.

This view does not imply, of course, that we shall not learn important things about human thinking and machine operation from careful analytical comparison. But it ought to be permissible for some of us to refuse the binary choices without being looked on as menaces to society.

III. By C. B. Crumb, Jr., Assistant Chief Engineer, Tally Register Corp., Seattle, Wash.

The problem of "how to talk about computers", which is the title of Mr. Flesch's article, is an immediate, practical problem to me. But Mr. Flesch reduces it to the rather philosophical and academic question "do machines think?"

That question is a good topic for academic discussion, and one on which all of us have views which we are willing to push. However, if an outsider asks me what my company does, he wants to know what our computers are, how they work, and what they can do. If I answer using the peculiar language of workers in this specialized field, my listener will soon be lost.

We need to be able to make these machines fully understandable to people in other fields of work. If we succeed, then we will convince them that computers of this day will not encroach upon any of our nobler thought processes. The people to whom we have to explain present no resistance, Freudian or otherwise, to having computers add up their grocery bill or control traffic at a busy highway intersection. But they will (and we will) resist the idea of computers rating their worth in society or choosing their vocations. When one understands our present-day machines, he knows they won't do those latter operations, at least not in our lifetime.

This task of making computers understandable is not easy. In writing articles on computers for publication in engineering journals, a large part of the effort should go to making the material readable by engineers in general, -- sales engineers, power plant engineers, technical executives — as well as computer, servo, and control system men. This requires very careful choice of words, and use of selected similes and analogies — this even for technical people. The job of describing computers for lay persons is still much greater.

It is true that we must give some thought to the philosophic impact of our creations upon thinking people at large. But let's also figure out how to describe them with "plain talk". Let's find a way to make computers seem less remote and more familiar to our listeners and readers — among whom there must be some prospective customers.

IV. By E. C. Berkeley, Consultant, New York and Boston

The article by Rudolf Flesch in the July issue of "Computers and Automation", although it was entitled "How to Talk About Computers", actually it seemed to me raised a rather different question: is it wise in talking about computers to say that they "think", and to use other anthropomorphic words that connote the behavior of living beings or human beings? or is it better simply to point out the parallel with thinking, to say that their operations are much like thinking, but not assert that their operations are thinking?

People today are only at the threshold of knowing the possible properties of machines that handle information automatically. Over the next 200 years, not to mention the years that lie still further ahead, information-handling machines will develop in ways

and to degrees that we of today must of necessity find very hard to imagine if we can do so at all. Considering the long future that lies ahead, it seems to me definitely unscientific to assert that "machines do not think", and worse still to say that "machines will never think". This view lays down unnecessary barriers to progress and development of information-handling machines.

We can for example say that machines so far do not think in terms of words, but only in terms of numbers, sets of characters, yes-noes, instructions, sequences of instructions, and such like. We can also say that many people will not be content with the assertion that machines do think until machines can think in terms of words, English words for example, and can carry on some kind of reasonable conversational discussion with a human being. Before this can happen, however, machines must be built that will be able to recognize the sounds of a language, English for example, take in a spoken word, and produce the phonemes (or basic sound-meaning units—English has about 41 phonemes, such as "voiced th" as in "there") of which it is composed, and thus "recognize" the word. We know enough about this problem already to be sure that its hardware solution is very difficult, and to be amazed at the powers of human beings to accomplish this recognition. But once such a machine is made, it would conceivably be equally able to listen to and recognize the words of any spoken language, given its phonemic structure. As for a machine uttering words, that of course has already been accomplished.

But the best rebuttal to any argument that such and such a thing is impossible -- that "machines do not think" -- is an example of the thing in question, showing that it actually exists.

In our laboratory, we have in mind constructing a small robot whom we speak of as James. James will store recorded on magnetic tape perhaps 8 or 10 separate spoken sentences -- James' "output". James will be able to utter these sentences through a loudspeaker as appropriate responses to certain kinds of stimuli. James will have an assortment of devices which will respond to pressure, touch, nearness, temperature, light, motion, etc. Such devices will be part of James' "input". And in between the input and the output, will be a number of relay circuits arranged so that James' output will consist of "appropriate" responses to James' input. But still James will not in the next ten years be able to listen to and recognize words.

If we had more money than we do have for the construction of James, it seems evident that we could make James into a robot that would be interesting and baffling to the ordinary person for perhaps as long as ten minutes. He would be a pretty good imitation of a simple-minded though deaf human being.

In any case, the real-world answer to much of the discussion about whether or not machines think is to specify one after another the items of behavior that are considered thinking, and then build them one after another into machinery. Many more arguments can be won by displaying an A that is a B, than by arguing that it is possible for an A to be a B.

ROSTER OF ORGANIZATIONS IN THE FIELD OF COMPUTERS AND AUTOMATION

(Edition 10, supplement, information as of August 10, 1953)

The purpose of this Roster is to report organizations (all that are known to us) making or developing computing machinery, or systems, or data-handling equipment, or equipment for automatic control and materials handling. Each Roster entry when it becomes complete contains: name of the organization, its address, nature of its interest in the field, kinds of activity it engages in, main products in the field, approximate number of employees, year established, and a few comments and current news items. When we do not have complete information, we put down what we have. Note: Beginning with this issue, makers of components only are transferred to another list, which see.

We seek to make this Roster as useful and informative as possible, and plan to keep it up to date in each issue. We shall be grateful for any more information, or additions or corrections that any reader is able to send us.

Although we have tried to make the Roster complete and accurate, we assume no liability for any statements expressed or implied.

This edition contains only revisions or additions as compared with Editions 7, 8 and 9, published in the April, May, and July, 1953 issues of COMPUTERS AND AUTOMATION, vol. 2, no. 2, 3, and 4.

Abbreviations

The key to the abbreviations follows:

Size

- Ls Large size, over 500 employees
- Ms Medium size, 50 to 500 employees
- Ss Small size, under 50 employees (No. in parentheses is approx. no. of employees)

When Established

- Se Organization established a short time ago (1942 or later)
- Me Organization established a "medium" time ago (1923 to 1941)
- Le Long established organization (1922 or earlier)

Interests in Computers and Automation

- Dc Digital computing machinery
- Ac Analog computing machinery
- Ic Incidental interests in computing machinery
- Sc Servomechanisms
- Cc Automatic control machinery
- Mc Automatic materials handling machinery

Activities

- Ma Manufacturing activity
- Sa Selling activity
- Ra Research and development
- Ca Consulting
- Ga Government activity
- Pa Problem-solving activity
- Ba Buying activity (used also in combinations, as in RMSa, "research, manufacturing and selling activity")

*C This organization has very kindly furnished us with information expressly for the purposes of the Roster, and therefore our report is likely to be more complete and accurate than otherwise might be the case. (C for Checking)

*A This organization has placed an advertisement in this issue of COMPUTERS AND AUTOMATION. For more information, see their advertisement. (A for Advertisement)

Burroughs Adding Machine Co., 6071 Second Ave., Detroit, Mich. -- headquarters; Research Division -- 511 No. Broad St., Philadelphia, Pa.; and elsewhere. *C, *A
Adding machines, bookkeeping machines, etc. Research division has made Burroughs Laboratory computer, an electronic digital test computer, assembled from pulse control units. Also has completed a fast-access magnetic-core memory to be attached to Eniac. Pulse control components, servomechanisms. This company owns Control Instrument Co. Ls(18,000) Le(1896) DSc RMSPa

Computing Devices of Canada, Lim., 338 Queen St. (headquarters), and 475 Cambridge St. (laboratories), Ottawa, Ont., Canada. *C, *A
Digital and analog computers, automatic navigation systems, electronic laboratory test equipment, simulators, servomechanisms. Research and development in instrumentation, automatic control, business sorting, scientific sorting, systems analysis. Ms(100) Se(1948) DASc RCPM Sa

Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena 8, Calif. *C, *A
Automatic electronic digital computers (Model 30-201). Digital and analog data handling and conversion systems (Sadic, Millisadic, etc.). Automatic translator magnetic tape to punched card. Ls(900) Me(1937) Dc RMSa

Electronic Associates, Inc., Long Branch, N. J. *C, *A
Digital-to-analog converter (Model 417). Digital plotting system (Dataplotter). General and special purpose analog computers, and devices. Special purpose digital devices. Ms(350) Se(1945) DAc RMSa

Electronic Computer Div. of Underwood Corp., 35-10 36th Ave., Long Island City, N.Y.
Constructing four types of electronic digital computers (Elecom-100, -120, -200, and a data-handling computer). Delay lines, pulse transformers, magnetic recording heads, magnetic drums, D.C. plug-in amplifiers. Ms(100) Se(1949) Dc RMSa

Ferranti Electric, Inc., 30 Rockefeller Plaza, New York 20, N.Y., agent for Ferranti Electric Ltd., Moston, England, and Mount Dennis, Toronto, Canada. *C, *A
Complete electronic digital computers (Ferranti; also called "Manchester Universal Electronic Computer"). High-speed photoelectric tape reader, which can read up to 200 characters per second. Magnetic drum and electrostatic storage components, etc. Ls(10,000) Le(1896) Dc RMSa

Intelligent Machines Research Corp., 134 So. Wayne St., Arlington, Va. *C, *A
Devices for reading characters on paper, etc. Pattern interpretation equipment. Sensing mechanisms. Digital computer elements. Ss(6) Se(1951) Dc RCMSa

International Business Machines Corp., 590 Madison Ave., New York 22, and elsewhere *C, *A
Punch card machines. Type 650, Magnetic Drum Calculator. IBM electronic Data Processing Machines, Type 701 (magnetic tape, magnetic drum, electrostatic storage). Card Programmed Calculator. Electronic calculating punch Type 604. Data processing equipment. Process control equipment. Automatic Source Recording Equipment. Ls(42,000) Le(1911) Dc RMSa

Laboratory for Electronics, 51 Pitts St., Boston 14, Mass. *C, *A
Analog and digital computers, special computers to suit customer requirements, delay lines (mercury, quartz), plug-in packages for computer applications, etc. Ls(700) Se(1946) DAc RMSa

Monrobot Corp., Morris Plains, N. J. *C, *A
Monrobot automatic electronic digital computers. Subsidiary of Monroe Calculating Machine Co. Ss(32) Se(1952) Dc RMSa

Monroe Calculating Machine Co., Orange, N. J., and elsewhere. *C
Desk calculating machinery for adding, calculating, and bookkeeping. SEE Monrobot Corp. Ls(4000) Me(1925) Dc RMSa

Potter Instrument Co., 115 Cutter Mill Rd., Great Neck, N. Y. *C, *A
Electronic counters. Electronic tag reader. Random access memory. High speed printer ("flying typewriter"). Ms(100) Se(1942) Dc RCMSa

Raytheon Manufacturing Co., Waltham, Mass. *C, *A
Radar, fire-control, microwave equipment. Big fast electronic digital computers (Raydac), one delivered. Tape handling mechanisms, magnetic heads, magnetic cores, shift registers. Ls(20,000) Me(1924) DAc RMSa

Telecomputing Corp., 133 E. Santa Anita Ave., Burbank, Calif. *C
Automatic data reading, recording, and plotting equipment (Telereader, Telecordex, Teleplotter). Ms(160) Se(1947) Dc RMSPa

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FORM FOR REPORTING ROSTER ENTRY (may be copied)

Name of Organization _____

Address _____

1. Types of computing machinery, or data handling equipment, or equipment for automatic control and materials handling, that you are interested in? _____

_____

2. Types of activity (manufacturing, selling, research, etc.) that you engage in? _____

_____

3. Any news or comments? _____

_____

4. Approximate number of your employees? _____

5. Year when you were established? _____

Filled in by ? _____ Title _____ Date _____

When you have filled in this form to the extent that you conveniently can, please send it to Edmund C. Berkeley and Associates, 36 West 11 St., New York 11, N. Y.

ROSTER OF ORGANIZATIONS MAKING COMPONENTS

(Information as of August 10, 1953)

The purpose of this roster is to report organizations making components (but not making complete systems) that enter into computing machinery or data-handling equipment or equipment for automatic control and materials handling. Since this would be a very large list if we included all organizations making motors, resistors, magnetic cores, condensers, etc., this roster is not a free listing. For the conditions of listing, see page 29; also, the listing is subject to editing for completeness and objectivity; for the abbreviations, see the "Roster of Organizations in the Field of Automatic Computers and Automation".

ROSTER

Alden Electronic and Impulse Recording Equipment Co., Alden Research Center, Westboro, Mass. *A

Facsimile recording equipment and facsimile components. Ma SEE Alden Products Co.

Alden Products Co., 117 No. Main St., Brockton, Mass. *A

General and specific components for digital and analog computing machinery; plug-in components, sensing and indicating components, magnetic delay line units, magnetic storage cores, etc. Ms(300) Me(1930) Ic RMSa

Alfax Paper and Engineering Co., Alden Research Center, Westboro, Mass. *A

Electrosensitive recording papers. Ma SEE Alden Products Co.

Sprague Electric International, Ltd., North Adams, Mass. *A

Capacitors, miniature and other. Ls Ic RMSa

PATENTS

by Hans Schroeder, Milwaukee, Wisc.

The following is a compilation of patents pertaining to computers and associated equipment, taken from the Official Gazette of the United States Patent Office, Vol. 670, issues as specified. Each item consists of: patent number / inventor(s) / assignee / brief description of invention.

May 19, 1953: 2,639,089 / A N Gleyzal, Cleveland, O / - / Resistor network for solving a set of linear equations with n variables.
2,639,090 / J E Sherborne, Whittier, Calif / Union Oil Co of Cal, L A, Cal / Electrical analog for oilbearing formations using appropriately shaped resistance plates.
2,639,092 / J B Retallack, N Y, N Y / Bell Tel Labs, N Y, N Y / Automatic telephone accounting and billing system.
2,639,416 / R W Graybill, Elmhurst, and H Sengebusch, Villa Park, Ill / Automatic Elec Lab, Chicago, Ill / Counting relay.
May 26, 1953: 2,639,859 / R Serrell, Princeton, N J / RCA / Transistor memory circuits using glow tubes.
2,639,860 / D H Reeves, Beulah, Mich / - / Mechanical multiplier (decimal).
2,639,965 / A L Holcomb, Tarzana, Calif / Western Elec, N Y, N Y / Apparatus for recording onto electrically conductive paper.
2,640,164 / G J Giel, Jr, and M C Burns, Richmond, Calif / Berkeley Scientific Corp, Richmond, Calif / Counter using ladder of magnetic material with saturable loops.
June 2, 1953: (No applicable patents).
June 9, 1953: 2,641,407 / A H Dickinson, Greenwich, Conn / IBM / Electronic multiplier.
2,641,408 / R A Rowley, Binghampton, and D C Newcomb, Endicott, N Y / IBM / Calculator controlled by comparison of two sets of punched cards.
2,641,409 / R H Dicke, Princeton, N J / - / Electronic device for counting pulses only while another set of pulses (gating-in-pulses) is present.
2,641,522 / G W King, South Lincoln, Mass / A D Little, Inc, Cambridge, Mass / Digital reader employing relays and a thyratron.
2,641,694 / C E Hallmark, Ft Wayne, Ind / Farnsworth Research Corp / Stepping-type pulse counter.
2,641,696 / S B Woolard, Schenectady, N Y / GE / Comparator of two binary numbers; output indicates agreement or disagreement.
2,641,717 / D H Toth, Spring Lake Park, Minn / US Sec'y of the Navy / Transistor multivibrator having one stable state; pulse amplifier.
2,641,725 / E Touraton and C Weill, Paris, France / Intl Standard Elec Corp, N Y, N Y / Multiple cathode gas discharge counting tube.
June 16, 1953: 2,642,223 / C S Barrett, Palos Park, Ill / Western Electric / Mechanical device for computing averages.
2,642,499 / F P Gohorel, Antony, France / Intl Standard Elec Corp, N Y / Automatic route selector actuated by dial pulses.
2,642,550 / F C Williams, Timperly, England / Natl Research Dev Corp, London, England / Information storage device using cathode ray tube.
June 23, 1953: 2,643,056 / A T Wellington and F S Rhodes, England / Powers-Samas Accounting Machines, London, England / Apparatus for comparing punched cards.
2,643,348 / D R deBoisblanc and R S Marsden, Jr, Bartelsville, Okla / Phillips Petroleum Co / Means for producing a power function of an input voltage by using nonlinear resistor having the required characteristic.

2,643,355 / L B Hallman, Jr, Dayton, O / - / Device which converts coded electrical signal into a specified number of rotations of a shaft.

June 30, 1953: 2,643,819 / Yuk Wing Lee and J B Wiesner, Belmont, and T P Cheatham, Jr, Marlboro, Mass / Research Corp, N Y / Apparatus for computing correlation functions of time series.

2,643,820 / F C Williams, Timperly, A A Robinson, Scunthorpe, and T Kilburn, Davyhulme, Manchester, England / Natl Research Dev Corp, London, England / Arrangement of circuits for adding binary numbers.

2,643,821 / D C Frager, Paris, France / Office Natl d'Etudes et de Recherches Aeronautiques, Paris, France / Device for computation of roots of polynomials using a cathode ray tube indicating results.

2,644,110 / J R Desch, Dayton, O / Natl Cash Register Co, Dayton, O / Electronic counter using a plurality of cascaded multi-element gas tubes.

2,644,111 / J R Desch, Dayton, O / Natl Cash Register Co, Dayton, O / Electronic counter using two sets of thyratrons.

2,644,112 / J R Desch, Dayton, O / Natl Cash Register Co, Dayton, O / Electronic counter using thyratrons in connection with two groups of cascaded multi-electrode gas tubes.

July 7, 1953: 2,644,886 / E O Holland, Cambridge, England / Pye Limited, Cambridge, England / Flip-flop circuit using pentodes. Output is taken off the screen grids.

2,644,892 / J B Gehman, Haddonfield, N J / RCA / Transistor circuit responding to interrogating pulses differently when input pulse is present or is not present.

2,644,893 / J B Gehman, Haddonfield, N J / RCA / Transistor circuit responding to an interrogating pulse which occurs within a predetermined interval after the occurrence of an input pulse.

2,644,894 / A W Lo and R P Moore, Jr, Haddonfield, N J / RCA / Transistor circuit having low-current stable and high-current unstable state; triggered by an input pulse.

2,644,895 / A W Lo, Haddonfield, N J / RCA / Monostable transistor circuit similar to previous patent except for input circuit.

2,644,896 / A W Lo, Haddonfield, N J / RCA / Bistable transistor circuit; circuit has one low-current and one high-current stable state.

2,644,897 / A W Lo, Haddonfield, N J / RCA / Counter using a plurality of bistable transistor circuits arranged in a ring.

2,644,910 / G E Hagen, Lawndale, Calif / Northrop Aircraft, Inc / Pulse amplifier using a multi-element cold cathode gas tube.

WHO'S WHO IN COMPUTERS AND AUTOMATION: SECTION 3

-- NOT BUSINESS, NOT PROGRAMMING -- L TO R

(First edition, cumulative, information as of August 3, 1953)

This is a sixth installment of a Who's Who of individuals in the field of computers and automation. The purpose of this Who's Who is to make it easier for all persons interested in this field to get in touch with each other in appropriate ways.

Contents. The following list consists of persons interested in computing machinery who have not reported as a main interest either "programming" or "business", for whom information has been received up to August 3, 1953, and whose last name begins L to R.

Reporting. If you are interested in any phase of computing machinery, robots, cybernetics, or automation, and if you would like to be included in the Who's Who, please send us: your name (please print), address, organization (and its address), your title, main interests (note list appearing under "Abbreviations" below, and specify any other interests), year of birth, your college or last school, years of experience in the field, your occupation, and any more information about yourself that you may care to furnish. (A blank for your Who's Who entry appears on another page in this issue). Your listing in the Who's Who does not depend in any way on your subscription to COMPUTERS AND AUTOMATION although of course your subscription will be welcome.

Entry. Each entry in the Who's Who when it becomes complete contains: name / title, organization, address / interests / year of birth, college or last school (background), years in field, occupation. The address has been substantially contracted to avoid the nuisance of unwanted mail. In cases where no information has been given (for example, about occupation) a "-" denotes omission.

Abbreviations. Since a great deal of information is to be presented, abbreviations have been extensively used. Nearly all these abbreviations can be easily guessed, like those in a telephone book. The letters A,B,C,D,E,M,P,S stand for main interests "Applications, Business, Construction, Design, Electronics, Mathematics, Programming, Sales", respectively, as provided for in the Who's Who entry blank.

Liability. Although we have tried to make each entry complete and accurate, we assume no liability for any statements expressed or implied.

Corrections. We shall be very grateful for any information, additions, or corrections that any reader is able to send us.

L: Lacey, Oliver L / prof, Univ Alabama / similarity to nerv sys opern / '16, Cornell U, 0, prof

Ladd, Robert Boyd / statn, U S Bur Budget, Wash, D C / A / '15, Tex U, Geo Wash U, 0, statn

Lakey, John G / -, Marchant Calc, Oakland, Cal / CE / '21, Ga Tech, -, -

Lakin, Henry Milton / res asst, WRRC, Ypsilanti, Mich / ADM, log des / '26, U Mich, 2, -

LaManna, Richard J / proj engr, Monroe Calc Mach Co, Orange, N J / DE / '27, U Md, 2,-

Lang, Raymond K / custr engr, IBM, - / E / '28, -, -, -

Lanier, Harold F / hd, Engrg Sec, Goodyear Aircraft Corp, Akron, Ohio / ACDE, comp compnts, test eqpt, electromech accessor / '20, Kansas State Teachers Coll, Ohio State U, 8, engrg suprvr

Larrowe, Boyd T / res asst, WRRC, Ypsilanti, Mich / CDE / '23, U Ill, 3, -

Larson, Dale F / res assoc, WRRC, Ypsilanti, Mich / ADE / '29, Wayne U, 1, engr

Larson, Harry T / mbr tech staff, Hughes Aircraft Res Dev, Pac Palisades, Cal / ACDE, comp sys, planning & analysis / '21, U Cal, 5, -

Larus, John R / vp & acty, Phoenix Mut Life Ins Co, Hartford, Conn / M / '90, Yale U, -, acty

Lash, Joseph F / res engr, Gen Motors Res Lab, Detroit / AE, info retrieval, experimentation / '16, U Cincinn, 4, -

Lazinski, Raymond H / elecnc res engr, Moore Sch EE, Phila / ACDE, neurophysiology, servomech / '27, U Pa, 3, elecnc res engr

Leavens, Dickson H / (retired), Colorado Springs, Colo / statl uses / '87, Yale(BA'09) (MA'15), 3, statl economist

Lehde, H / sr engr, Control Instrument Co, Bklyn, N Y / DE, fire contr / '04, Rensselaer, 10, -

Leifer, Joseph C / elecnc sci, Naval Res Lab, Wash, D C / CDE, res & dev / '28, GaTech, 5, -

Leiner, Alan L / hd, Sys-Des Grp, Elecnc Comp Lab, Natl Bur Std, Wash, D C / AD/ '14, Yale U, Harv U, 6, physicist

Leitmann, George / physicist, Res Dept, Naval Ordn Test Sta, China Lake, Cal / AM, solution of ballistic & allied equations / '25, Columbia(BS,MA), UCLA, 3, physicist

Leonard, Patrick J / mathn, Watertown Arsenal Lab, Mass / M / '25, Boston Coll Grad Sch, -, mathn

Leutert, Werner W / chf, Anal & Compn Br, Aberdeen Prvg Grnd, Md / ACD / '22, Swiss Fed Inst Tech, 5, mathn

Lewis, Willard D / dir switchg res, Bell Telephone Labs, Murray Hill, N J / aplcn comp techniques to tel switchg / '15, -, 3, engr

Lieberman, Herman / asst proj engr, Bendix Aviation Corp, Clifton, N J / ADEM / '24, U Mich, 3, elecnc engr

Liggett, Irving C / mgr, Compn Lab, IBM, Endicott, N Y / AMS / '24, U Tex, 5, -

Lindley, Peter L / assoc res engr, Burroughs Res Division, Phila / ADE, res & dev in elecncs & mag stor devices / '22, Ohio Wesleyan, Purdue U, 6, -

Lohse, E / sr engr, Control Instrument Co, Bklyn, N Y / DE, fire contr / -, CCNY, 9, -

Lorch, George H / patent atty, Monroe Calc Mach Co, Orange, N J / C, patents / '00, Lehigh U, Bklyn Law, 12, atty

Loud, Warren S / asst prof, Univ Minnesota, Minnpls / M / '21, MIT, 3, -

Loughry, Bruce, Jr / res asst, WRRC, Ypsilanti, Mich / ACDEM, compnt des / '29, U Cincinn, 1, -

Lowan, Arnold N / prof physics, Yeshiva Univ, N Y / AM / '98, Columbia U, -, -

Lubkin, Samuel / tech dir, Elecnc Comp Div, Underwood Corp, N Y / ACD / '06, Cooper Union Inst Tech, U Chic, NYU, 7, engr

Lubkin, Yale Jay / stud, Univ Pa, Phila / ACDEM / '31, U Pa, 2, -

Luke, John W / mathn-apld sci, IBM, San Jose, Cal / AM, techl sales / '24, Stanford U, 3, mathn

Lukoff, Herman / Univac proj engr, Eckert-Mauchly Div, Rem Rand, Phila / CDE, testing comp mach / '23, U Pa, 9, -

M: MacDonald, James Ross / physicist, Tech Centr, Armour Res Found, Chic / ADEM, storage / '23, Oxford U (PhD), 2, physicist
Maginniss, Frank J / mgr, Spec Investgn Sec, Gen Elec, Schenectady, N Y / A / '09, NYU, U Pa, 12, engr
Malanyn, Eugene / res assoc, WRRC, Ypsilanti, Mich / ACDE / '24, Wayne U, 4, elecnc engr
Mallett, Frank McL / assoc prof, Ohio State U, Columbus, O / AM / '13, Kenyon, Ohio State U (MS '48), O, teacher
Maloney, Clifford J / chf, Statl Br, Chem Corps, Camp Detrick, US Army, Frederick, Md / AM / -, Iowa State (PhD), 12, statn
Marcovitz, Morton W / asst res engr, -, Phila / ACDE / '27, Drexel Inst Tech, 2, -
Margolin, Benj / sales engr, -, Camb, Mass / ACDE / '05, MIT, O, elec engr
Martin, Wm L / des spec, Telecomputing Corp, Burbank, Calif / ACDE, design of analog and digital systems / '23, U Wash, U Calif, 6, designer
Mather, Norman W / assoc prof, Elec Engrg Dept, Princeton U, N J / E, pedagogy / '14, Princeton U (PhD), -, teacher
May, Harold F / supvr, Teleregister Corp, N Y / CDE / '06, Cooper Union, 7, -
McCarroll, Joseph F M, Jr / elecnc engr, Teleregister Corp, N Y / CDEM / '27, Newark Col Engrg, 3, engr
McConville, G R / -, Aero Div, Mpls-Honeywell, Minn / ADEM / '25, U Minn, -, elecnc engr
McCormick, E M / elecnc engr, -, NBS, Corona, Calif / A, missile data reducn / '20, Kansas State, 3, elecnc engr
McCulloch, Warren S / -, Res Lab Elecncs, MIT, Camb, Mass / synaptic transmission of centrl nervous system / '98, -, 30, res
McDonald, John J / field engr, Cec Instruments, Chi / AES / -, U Chi, 3, res engr
McLeod, John H, Jr / hd, Lab Br, NAMTC, Pt Mugu, Calif / A / '11, Tulane, 3, engr
McVicar, Kenneth E / staff engr, Dig Comp Lab, MIT, Camb, Mass / DE / '20, MIT, 4, engr
Mechelen, Kenneth Van / -, Buffalo, N Y / EDM / '35, U Buffalo, 1, stud
Mekota, John E, Jr / sen engr, Raytheon Mfg Co, Waltham, Mass / ADEM / '21, MIT, 3, elecnc engr
Mellon, Bob / statl engr, Gulf Oil Corp, Pgh / A / '16, Carn Inst Tech, 2, mngm and chem engr
Mengel, Milton E / spec repr, Sales Div, Burroughs Adng Mach Co, Phila / S / -, -, 26, -
Mergler, Harry Winston / hd, Comp Devt Group, Lewis Flight Propulsion Lab, Cleveland/ CD, machine tool automation / '24, Case Inst Tech, 10, physicist
Mesner, Max H / res engr, Lab Div, RCA, Princeton, N J / DE, storage tube memory devt / '12, U Mo, 5, engr
Meyer, Herbert A / prof math & dir, Stats Lab, U Fla, Miami / AM / '05, U Iowa (PhD), 2, prof
Meyer, Morton A / chf, Statl Procedures, P & H Div, Bur Census, Wash, D C / statl tabulns / '17, -, 10, survey statn
Meyers, James G / elecncs inspector, Dept of Defense, Bronx, N Y / DE / '14, -, 4, govt inspector & consultant
Miles, James G / asst dir sales, -, Engrg Res Assoc, St Paul, Minn / - / -, U Nebr, St P Col of Law (BS Law), 5, elec engr
Mintzer, Lester / proj engr, Rem Rand Lab for Adv Res, Stamford, Conn / CDEM, storage devices / '23, NBS Grad Schl, 5, elecnc engr
Moffat, Burnham / jr fellow, Mellon Inst, Pgh / CE / '27, Harv (MS), 2, component res
Malloy, Charles T / hd, Analysis Group, Vitro Corp Amer, W Orange, N J / M / '14, NYU (PhD), -, mathn
Monroe, Kenneth E / res asst, WRRC, Ypsilanti, Mich / DE / '29, U Denvr, 1, elec engr

Moran, James M / exec vp, Barkley & Dexter Labs, Boston / DE, special automatic mach & inst / '16, Rutgers ('40), -, consltng engr
Morse, Philip M / prof physics, MIT, Camb, Mass / A / '03, -, 20 as user, prof
Morton, Paul L / prof, E E Div, U Cal, Berkeley / ACDE / '06, U Wash, 10, prof
Morton, Walter B, Jr / sr engr, Eckert-Mauchly Div, Phila / EM, econmcs / '26, Carnegie Tech, Lehigh, 2, elec engr
Mount, Benj H, Jr / assoc engr, Westinghouse Elec Corp, Pgh, Pa / AM / '17, U Pgh,2, engr
Mullaney, Frank C / staff engr, Engrg Res Assoc, St Paul, Minn / ACDE / '23, U Minn, 6, elec engr
Mullendore, Ralph E / chf operns, Elecnc Sys, Bur Census, Wash, D C / A / '10, U Md, 17, Univac operns ofcr
Murphy, Robert F / engr, -, Evansville, Wis / ADEM / -, Lincoln Engrg, 1, engr
Mussell, Howard A / proj engr, IBM Lab Annex, Pkpsie, N Y / DE / '20, -, 12, comp desr
Myers, Wilson J / -, Goodyear Aircraft Corp, Canton, O / AD / -, -, -, -

N: Nelson, Eldred / hd, Comp Sys Dept, Hughes Aircraft Co, Culver City, Cal /D/'17, U Cal, 8, -
Nelson, L F / vp, Elecnc Res Labs, L A, Cal / ACDEM / '14, U Utah, O, elecncs engr
Neuner, Conrad / servo comp techn, Camp Polk, La / EM / '29, USAF Tech Sch, 4, res techn
Newton, Kenneth V / sr engr, Bendix Aviation Corp, Hickman Mills, Mo / CDES / '22, U Mo, 5, engr
Nicola, Renator N / engr, Lab for Elecncs, Boston / DE / '23, Rutgers U, 2, elecnc engr
Nilson, Edwin N / assoc prof math, Trinity College, Hartford, Conn / M / '17, -, 3, teacher & consultnt
Nishbau, Jerome L / engr, Raytheon Mfg Co, Waltham, Mass / AD / '27, Cornell U, 3, engr
Nord, Hans H / engr, A B Dumont Labs, Clifton, N J / DEM / '23, Newark Col Engrg, -, engr
Norris, C A / chf engr, Internl Resistance Co, Toronto, Can / ADS / '13, U Toronto , -, elec engr
Norris, Edith T / mathn, Natl Bur Std, Wash, D C / M / '23, Geo Wash U, 7, mathn
Notz, William A / elecnc sci, Natl Bur Std, Wash, D C / ADEM, sys des, compnts /'22, Harv U, Geo Wash U, 5, physicist
Noyes, R H / elecncs engr, Signal Corps Engrg Labs, Coles Signal Lab, Red Bank, N J/ EM / '04, U Maine, Harv, -, elecnc engr
Nykiforak, Raymond / -, -, Edmonton,Alberta, Can / ACEM, res in all sci / '29, -, O, mech
Nyman, Alex / proj engr, Anderson Nichols Co, Boston, Mass / ACDE / -, -, -, engr
Nymberg, R J, Jr / elecnc engr, Bendix Aviation Res Labs, Detroit, Mich / CDEM, des & constr mag drum storage sys / '26, U Detroit, 2, elecnc engr

O: O'Brien, John A / sec leader, MIT, Dig Comp Lab, Camb, Mass / CDE, comp compnt des / '21, MIT, 6, -
Odle, John W / hd, Math Div, U S Naval Ord Test Sta, China Lake, Cal / M / '14, U Mich (PhD'40), -, mathn
Ogden, Richard H / assembly analyzer, Elecnc Data Proc Mach, IBM, Wappingers Falls?, N Y / C / '20, Cornell U, 1, engr
Ohlenkamp, R M / des engr, Bendix Aviation Corp, Burbank, Cal / ACD, desr products & automatic prodn lines / '23, U Minn, 5, des engr
Okada, Robert H / assoc res engr, Burroughs Adding Mach Co, Phila / DE / '25, U Pa , 4, elec engr
Oldenburg, Kenneth F / engr-supvr, Clary Multiplier Corp, San Gabriel, Cal / D /'19, Ill Inst Tech, 2, engr

Oldenburger, Rufus / mathn-engr, Woodward Governor Co, Rockford, Ill / AM / '08, Univ -, 5, mathn
Olver, F W J / sci staff, Math Div, Natl Physical Lab, Middlesex, Eng / AM / '24,London U, 8, -
O'Neal, R D / asst div mgr, Consol Vultee Aircraft Corp, Ft Worth, Tex / AE, res mgt/ '14, U Ill, 3, -
Orvedahl, Walter / staff mbr, U Calif / DE, electrostatic stor des / '18, S Dak Sch Mines & Tech, 2, designer
Oster, Stanley M / dev engr, Eckert-Mauchly Div, Rem Rand, Phila / D / '26, U Pa, 2, mechl & elec engr
Overn, Orlando E / prof, Wisc State Col, Milwaukee / M / '85, Columbia U (PhD), 0, math teacher

P: Paine, B B / compnts engr, Dig Comp Lab, MIT, Camb, Mass / E, res & dev elecnc compnts / '30, Union Col (BSEE'51), MIT, 2, engr
Parkhurst, A C / -, -, Pattonville, Mo / ACDEM / -, -, 0, -
Parkin, Thomas R / stf asst to dept hd, Comp Div, Raytheon Mfg Co, Waltham, Mass/ADS/ -, U Cal, 5, des engr
Peiser, Alfred M / sr mathn, Hydrocarbon Res, N Y / AM / '19, Cornell U (PhD'44), 3, mathn
Pepinsky, Ray / res prof physics, X-Ray Crystal Anal Lab, Dept Physics, Pa State Col, State College, Pa / ACDEM / '12, U Chi (PhD'40), 7, prof
Perlin, Irwin E / prf math, Georgia Inst Tech, Atlanta, Ga / AEM / '11, U Chi, 2, res prof
Peterson, C Gordon / dist agt, Marchant Calculators, Boston / ES / '05, NEn U, 30, -
Pfeiffer, John E / -, -, New Hope Pa / AEM / '15, Yale, -, writer
Pike, Eugene W / sec hd, Raytheon Mfg Co, Waltham, Mass / DM, analog comp, operns res, physics, editing, mechl linkage / '09, Princeton (PhD), Harv (BS), 4, -
Pitcairn, Joel / asst res engr, Burroughs Adng Mach, Phila / M / -, U Pa, 1, -
Plew, H E, Jr / elecnc engr, Comp Res Corp, Hawthorne, Cal / DEM / '24, Wash U, St Louis U (MS Physics), 1, elecnc engr
Pode,Leonard / -, David Taylor Model Basin, Silver Spring, Md / ADM / '20, Catholic U, 3, physicist
Podell, Barney / secy, Monarch Metal Prod, Mt Vernon, N Y / S / '07, Cornell U, 5, sales mgr
Polachek, Harry / hd, Appld Math Lab, David Taylor Model Basin, Silver Spring, Md / AM / '13, Columbia U, 10, mathn
Poland, William B / elecnc sci, Naval Res Lab, Wash, D C / DEM, mach log, info theory, res / '20, Lehigh U, 5, -
Polisco, Joseph W / -, -, Cranford, N J / DEM / -, Stevens Inst Tech, 0, mech engr
Potash, Jerry / chf engr, Ortho Filter Corp, Paterson, N J / CE, mfg comp eqpmt / -, Bklyn Polytech, 2, engr
Power, William L / stud, Valparaiso Tech Inst, Ind / ACDEM / '32, -, 0, --
Prichard, Arthur C / physicist, Signal Corps Engrg Labs, Red Bank, N J / AE / '04, U Ky, 0, -
Prince, M David / res engr, Georgia Tech Exper Sta, Atlanta, Ga / ACDE, res, dev radar / '26, Ga Tech (MSEE), 0, engr
Prothers, Lloyd T / res engr, Bendix Comp Div, Redondo Beach, Cal / CDE / '22, Stanford U, 5, elecnc engr
Prudden, David W / sr sys acctnt, -, Empire, Oreg / IBM sys / -, -, -, acctnt

Q: Quady, Emmett R / elec engr, Consol Engrg Corp, Pasadena, Cal / DE / '20,U S Naval Acad, 6, engr
Quinby, E J / pres, Monrobot Corp, Morris Plns, N J / ACDEMS, admn, dev / '94, CCNY, 33, elec engr

R: Radack, Bernard / -, Ordnance Supply Ofce, Mechanicsburg, Pa / A / '26, Syracuse U, -, -

Raffa, Peter E / Elecnc engr, Technitrol Engrg Co, Phila, Pa / CDM / '26, Villanova Col, 2, engr

Rafferty, John B / elecncs engr, Natl Bur Std, Wash, D C / CDE, electrostatic stor (Wms) / '22, Boston Col, 6, engr

Rahmel, Henry / vp, A C Nielsen Co, Chi / A, market res / -, MIT, 6, -

Rajchman, Jan A / res physicist, RCA Labs, Princeton, N J / DE / '11, Swiss Fed Inst Tech, Zurich, 12, res

Rauch, Konrad / dept hd, Natl Cash Register Co, Dayton, O / ACD / '00, Polytech H S, Munich, Germany / 16, elec engr

Rauch, Lawrence L / assoc prof, Dept Aero Engrg, U Mich, Ann Arbor / ADEM / '19, Princeton U (PhD), 3, teacher-res

Reed, Irving S / staff, Lincoln Lab, MIT, Camb, Mass / DEM / '23, Cal Inst Tech (PhD '49), 5, mathn

Reed, F Everett / hd, Appl Mech Grp, Arthur D Little, Camb, Mass / AM / '14, MIT, -, mech engr

Relis, M J / sec hd, Control Instr Co, Bklyn, N Y / DE, fire control / '20, CCNY, 4, -

Richman, Richard / proj engr, Technitrol Engrg Co, Phila / CD / '24, Moore Sch EE, U Pa, 2, elec engr

Richards, C H / elec engr, Naval Prvg Grnd, Dahlgren, Va / ADE / '19, U of N H Grad Sch, Harv U, 7, engr

Rideout, V C / assoc prof, Elec Engrg Dept, U Wisc, Madison / ACD / '14, Cal Tech,3, prof elec engrg

Riebman, Leon / proj engr, Amer Elecnc Labs, Phila / DE, circ res & dev / '20, Moore Sch EE, U Pa, 4, engr

Rimbach, Richard / -, -, Pittsburgh, Pa / A, publishing / '95, MIT, 0 consltnt

Ritter, Eugene K / dir, Compn & Ballistics, U S Naval Prvg Grnd, Dahlgren, Va / ADM/ '09, U Va, 4, mathn

Roberts, Arthur S / partner, Roberts & Haber, Ligonier, Pa / ACES, mfg / '16, MIT,6, sales engr

Roepe, Carl H / dept mgr, McLellan Stores Co, N Y C / - / '02, Muhlenberg (AB), 20 , mach acctnt

Rogers, Mortimer D / tech engr, IBM Corp, Endicott, N Y / DEM / '17, Mich State Col, 6, tech engr (registd prof engr)

Rollert, Donald H / sr proj engr, Mergenthaler Linotype, Bklyn, N Y / AS / '22, USCG Acad, 3, elec engr

Rooney, Walter Richard / consltg engr, Dept Defense, Falls Church, Va / E / '19, Ga Tech, 3, engr

Rosander, A C / mathl statn, Bur Int Rev, Wash, D C, & lecturer in statcs, Geo Wash U / apln problty statcs to mgt / '03, U Chi, 15, statn

Rosen, J Ben / res assoc, Princeton U, Princeton, N J / M / '22, Columbia U (PhD, appld math, '52), 4, appld mathn

Rosenberg, Jack / dev engr, Elecncs Lab, Gen Elec Co, Syracuse, N Y / DE / '18, MIT, 6, engr

Rosenberg, Milton / res engr, RCA Labs, Princeton, N J / ACDE / '22, Drexel Inst Tech, 6, res engr

Rosenthal, Solomon / chf, Engrg Operating Unit, Elecncs Sec, Univac Instln, USAF , Wash, D C / E, maint / '24, -, 8, elecnc sci

Ross, Richard M / sales mgr, Elecncs Div, Sylvania Elec Prod, N Y C / S / '23, -, -, salesman

Rotenberg, Manuel / stf mbr, MIT, Camb, Mass / AM / '30, MIT, 2, -

Rothery, John L / proj chf, AF Camb Res Center, Mass / CD / '17, MIT (BS '42), 5, elec engr

Rothman, Abe / asst chf, Ofc Statl Std, U S Bur Labor Stat, U S Dept Labor, Wash, D C / AM, statl proc / '10, Amer U, -, statn

Rowan, Thomas D / engr, Engrg Res Assoc, Rem Rand, St Paul, Minn / CD / '20, Cath U Amer, 3, elecnc engr

Rubin, Milton David / stf mbr, MIT, Camb, Mass / DEM / '14, Harv U, 7, engr

Ruble, George B / mbr tech stf, Bell Telephone Labs, Murray Hill, N J / ADM / '23, U Vt, -, engr & physicist

Rudahl, A E / chf engr, G M Giannini Co, Riverside, Conn / ACD / -, -, engr

Rulon, Phillip J / prof educ, Harv U, Camb, Mass / ACDEM / '00, U Minn, 5, res

Russell, E S / asst controller, R H White Corp, Boston, Mass / A / -, -, -, -

Russell, John B / prof & exec ofcr, Elecl Engrg Dept, Columbia U, N Y C / AEM / '07, MIT (DSc), 25, teacher & consltnt

Ryavec, Ernest A / Comdr, USNR, engrg ofcr, Naval Insptr Ordn, Convair, Guided Missile Div., Pomona, Cal / A / '16, Cal Inst Tech, -, naval ofcr

ADVERTISING -- SEPTEMBER, 1953

The purpose of COMPUTERS AND AUTOMATION is to be factual, useful, and understandable. For this purpose, the kind of advertising we desire to publish is the kind that answers questions, such as, What are your products? What are your services? And for each product, What is it called? What does it do? How well does it work? What are its main specifications? Adjectives that express opinion are not desired. We reserve the right not to accept advertising that does not meet our standards.

Every advertisement in this issue, we believe, is factual and objective. For these reasons, we think that the advertising is likely to be worth reading. So far as we can tell, the statements made are reasonable, informative and worth considering:

Following is the index to advertisements:

Advertiser	CA No.	Subject	Page
Alden Products Co.	73	Computer Components	37
Burroughs Adding Machine Co.	74	"Unitized"Pulse Control Equipment	28
Computing Devices of Canada, Lim.	75	Magnetic Drums and Drum Assemblies	27
Computers and Automation	76	Advertising; Roster Listing Conditions; Inquiry Forms	29
Consolidated Engineering	77	Analog-to-Digital Converters and Computing Systems	32
Electronic Associates	78	Analog Computers	38
Ferranti Electric	79	High-Speed Tape Reader	35
Intelligent Machines Research Corp.	80	Electronic Reading of Printed Characters, etc.	31
International Business Machines Corp.	81	Electronic Computers: 701, 650, etc.	36
Laboratory for Electronics	82	Solid Delay Line	37
The Macmillan Co.	83	"Design for Decision" and Other Books	35
Monrobot Corp.	84	Monrobot Computer	40
Potter Instrument Co.	85	Counter of Megacycle Frequency and Time	34
Raytheon Manufacturing Co.	86	Computing Services	29
Sprague Electric International, Lim.	87	Miniature Capacitors	41
Telecomputing Corp.	88	Data Processing Service	30

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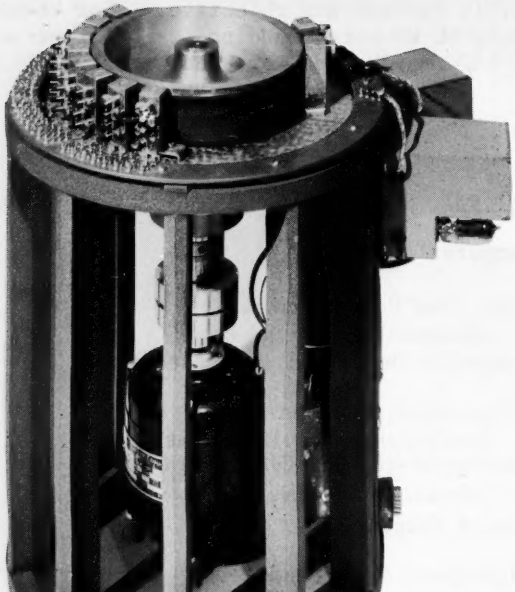

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- engineering consulting
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FOR APPLICATIONS IN RADAR, TELEMETERING, DIGITAL COMPUTING, TELEVISION, NUCLEAR PHYSICS

Flip-Flop, Type 1101C—another of the basic elements in Burroughs' integrated line of "Unitized" Pulse Control Equipment.

"Unitized" Pulse Control Equipment

saves time and money in electronic engineering

There's no longer any need to tie up engineering personnel with the time-consuming work of developing and "breadboarding" electronic test circuits. Burroughs, a leader in the office machine industry, now offers an integrated line of "Unitized" Pulse Control equipment covering all the basic functions in pulse circuit engineering. These one-basic-function units are designed with a maximum of flexibility to be used as building blocks for test systems ranging from the very simple to the most complex. Engineers need only make a block diagram of the apparatus needed, assemble the necessary Burroughs units in the plug-in rack, and interconnect them with the various standard coaxial cables and accessories. It's really that easy! It's equally easy to reassemble your units for a different project when your present tests are completed.

YOU SIMPLY "PLUG IN" BURROUGHS FLIP-FLOPS

Burroughs Flip-Flop, Type 1101C, demonstrates the one-basic-function principle that makes Burroughs "Unitized" Equipment so suitable for your needs.

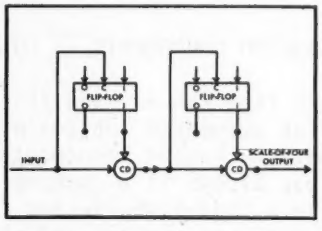
This flip-flop is a bistable circuit designed specifically to provide an output gating voltage to be used in coincidence circuits. The unit contains a pentode Eccles-Jordan circuit capable of being switched at rates up to 2.5 megacycles per second, with 0.1 microsecond pulses.

There are three inputs—Zero, One and Complement—operating from pulse amplitudes of 12 volts or more. Coaxial output jacks marked "Zero Gate" and "One Gate" supply either 0 volts or -23 volts at an impedence level of approximately 680 ohms.

Two neon lights on the front of the panel indicate the position of the flip-flop. A terminal block on the rear of the unit can be used to operate indicator lights installed at a remote point for visual monitoring.

Proved by more than two years of constant use, Burroughs "Unitized" Pulse Control equipment has been purchased by many leading electronic research organizations. Some of the users are: Massachusetts Institute of Technology, University of Michigan, Stanford Research Institute and National Union Radio Corporation.

Scale-of-Four Binary Counter Using Burroughs "Unitized" Equipment



The left flip-flop, Type 1101C, changes state with each input pulse, so that the left coincidence detector (CD) or gate, Type 1201B, is alternately opened and closed with succeeding input pulses, with the result that every other input pulse passes through the left coincidence detector, giving a count of 2. A similar flip-flop and gate combination cascaded to the first combination gives a total scale of 2 x 2=4. The number of flip-flop and coincidence detector combinations that can be cascaded is unlimited.

For full information on Burroughs "Unitized" Pulse Control Equipment, write or call Department 17B, Electronic Instruments Division, Burroughs Corporation, 511 N. Broad St., Philadelphia 23, Pa.

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TECHNICAL SALES DEPARTMENT
OTHER BULLETINS
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Magnetic Recording Heads DL-Y-2
Magnetic Shift Register DL-Y-3
Tape Handling Mechanisms DL-Y-5
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RAYTHEON
MANUFACTURING COMPANY
WALTHAM, MASSACHUSETTS

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Any organization making components that can be used in computing machinery or data-handling equipment or equipment for automatic control or materials handling may be listed in the "Roster of Organizations Making Components". The cost for the listing is $3 a line with a minimum of four lines; if a company making components advertises in the same issue, it will receive a four-line listing free. The listing will be subject to the customary editing for completeness and objectivity.

If you are interested in a listing for your organization, please supply the information for a Roster entry (see p. 15) and write to Edmund C. Berkeley and Associates, 36 West 11 St., New York 11, N. Y.

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COMPUTERS AND AUTOMATION

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ARTICLES: April: The Art of Solving Secret Ciphers, and the Digital Computer — by Fletcher Pratt, Author of "Ordeal by Fire"
Avenues for Future Development in Computing Machinery — by E.C. Berkeley
Hungarian Prelude to Automation -- by Gene J. Hegedus
May: Compiling Routines — by Grace M. Hopper, Remington Rand
Mechanical Translation — by Andrew D. Booth, Birkbeck College, London
Medical Diagnosis -- by Marshall Stone, University of Chicago
July: Machine Translation -- by Y. Bar-Hillel, Mass. Inst. of Technology
Robot Traffic Policemen -- by George A.W. Boehm, Science Editor, Newsweek
How to Talk About Computers — by Rudolf Flesch, Author of "Art of Plain Talk"

REFERENCE INFORMATION: Roster of Organizations in the Field • List of Automatic Computers • Who's Who in the Field • Books and Other Publications • Glossary • Summary of Patents

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MAIL THIS COUPON, or copy it: TO: Edmund C. Berkeley and Associates
36 West 11 St., New York 11, N.Y.

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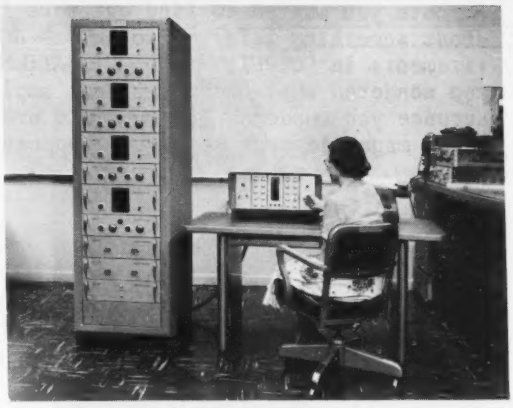
Sadic Systems

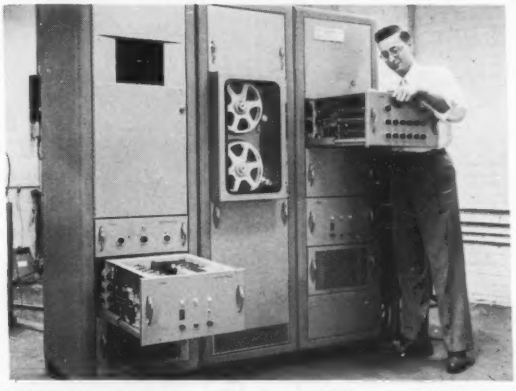
Extremely high accuracy (1/10%) and sensitivity combined with a one-per-second sampling rate adapt SADIC systems to a wide variety of research and industrial applications. Systems can be designed to accept analog signals (from strain gages and other resistive-type transducers or thermocouples) either in parallel or in time sequence. Conversion is made to 3-digit form, and readout may be in the form of punched cards, punched tapes, typewriters, etc. Systems now installed range from one to 12 channels in size.



SADIC systems of any desired size may be assembled from standard modules. The above system contains four channels operating in time parallel.

MilliSADIC Systems

Featuring very high speed and medium precision, these systems sample analog data up to 1000 times per second and convert it to binary-coded decimal form with 0.2-0.3% accuracy. Systems can sample either a single phenomenon at a high rate or many different phenomena sequentially. Now installed at a leading West Coast missile-evaluation center, the first MilliSADIC system will digitize analog data recorded on magnetic tape by ground telemetering equipment.



Although tailored to fit a specific set of test conditions, the 35-102 MilliSADIC is made up of standard units.

Computer Systems

Computational speed is unusually high in the many possible systems assembled around the Model 30-201 Automatic Digital Computer. Operating on a binary-coded-decimal number system, the computer's magnetic-drum main memory stores 4000 words, plus 80 additional words in the "quick-access" memory. Number length is 10 decimal digits plus a sign designation. A single-address code is employed, with a total of 42 basic commands. Most operations are executed at rates of 500 per second. The Model 30-201 Computer is the central unit about which many computer systems can be designed. A wide variety of auxiliary input and output equipment, plus facilities for additional word storage, can be combined in systems adaptable to many scientific, engineering and statistical applications. Three complete systems are now under construction. Two will be installed at rocket-missile test centers; the third will be used for basic computer development.

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What would be the easiest, most convenient way for you to find out?

Thinking about the answer to that question, we have adopted "Reader's Inquiry Forms". One of them is below. We hope it will be a convenience to you.

The CA numbers on the form refer to the CA numbers shown in the index to advertisements.

We have included a Who's Who information form in case you wish to use it.

Edmund C. Berkeley and Associates
Publishers of COMPUTERS AND AUTOMATION
36 West 11 St., New York 11, N. Y.

Instructions: (1) Cut out on dashed lines below. (2) Take an ordinary envelope. (3) Fasten this label on front of envelope (4) Complete this form, put it in the envelope, seal and mail.

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( ) Mathematics
( ) Business
( ) Programming
( ) Other (specify):

College or last school?.....

Years of experience in computing machinery field?.....

Occupation?..... (Enclose more Information about yourself if you wish — it will help in your listing.)

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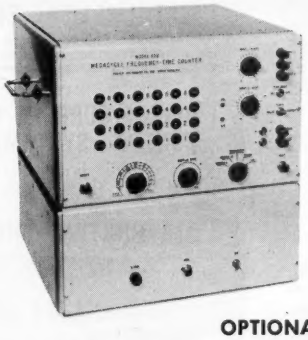
Megacycle Frequency Time Counter

Potter



Use it, too, as an accurate secondary frequency standard with outputs of 100, 10 and 1 kc; 100, 10, 1 and .1 cps.

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such as additional decades, mechanical registers, preamplifiers, and 1 mc crystal for interval resolutions to one usec, further increase the utility of the Model 850.

Only Potter Instruments offer a choice of the famous Potter 1-2-4-8 four lamp readout for maximum reliability and readability or the 0-9 ten lamp readout for direct digital indication. Adjustable display time for either indication provides automatic or manual reset after the reading period.

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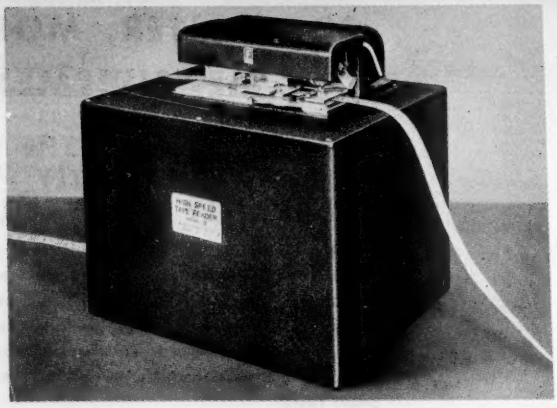
If you are now using awkward, time-consuming methods of measurement, you can save time and money by putting this universal measuring instrument into your program now. Like every Potter product, the Model 850 is the industry standard, and is always specified wherever results are important. For complete information and our recommendations on your specific laboratory or production problem, write to Department 9-N, the Potter Instrument Co., Inc., Great Neck, New York.

113

POTTER INSTRUMENT CO., INC.

115 CUTTER MILL ROAD — GREAT NECK, N. Y.

FERRANTI
HIGH SPEED TAPE READER



FAST Tape is read at speeds up to 200 characters per second. The tape can be stopped from full speed within .03 inch, and can be accelerated from rest to full speed in 5 mili seconds.

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SIMPLE The tape is easily inserted and the friction drive takes splices without difficulty. A tape may be passed through the reader thousands of times without appreciable wear.

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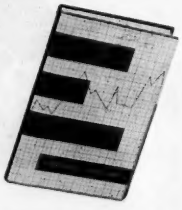

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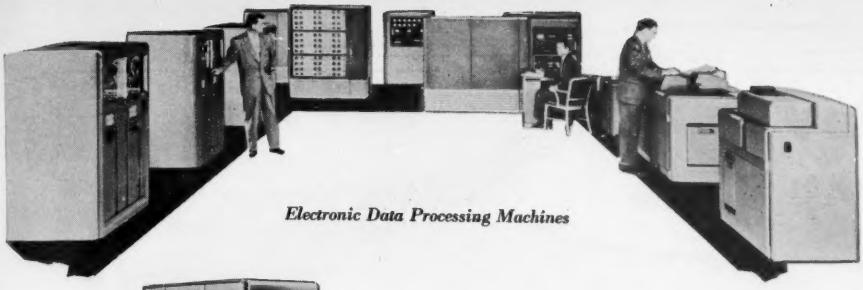
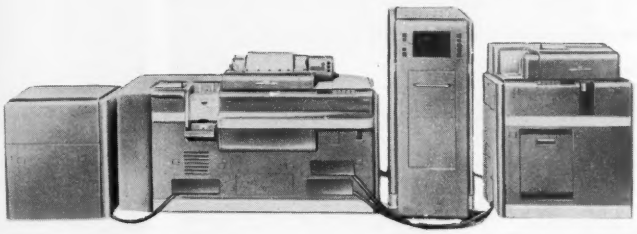
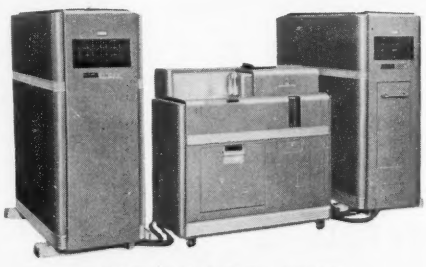


Electronic Data Processing Machines

Magnetic Drum Calculator



Card-programmed Electronic Calculator



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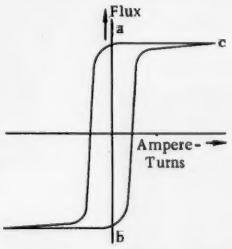

MATERIAL - a grain-oriented heat-treated alloy of nickel-iron with an extremely rectangular hysteresis loop, magnetically saturable in a given direction by application of a relatively weak magnetizing field. Once magnetized, removal of the magnetizing force leaves core in either state "a" or "b", depending on original direction of magnetization.

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ALDEN STATIC MAGNETIC MEMORIES OR LINES

2 Alden Static Magnetic Memories (#5100RA) consisting of miniature toroidal core having 3 windings mounted on terminal card with resistor and rectifier coupling circuit. $10.00*

*Prices in accordance with our Standard Component Proposal of 10/15/49, limited to this offer only.

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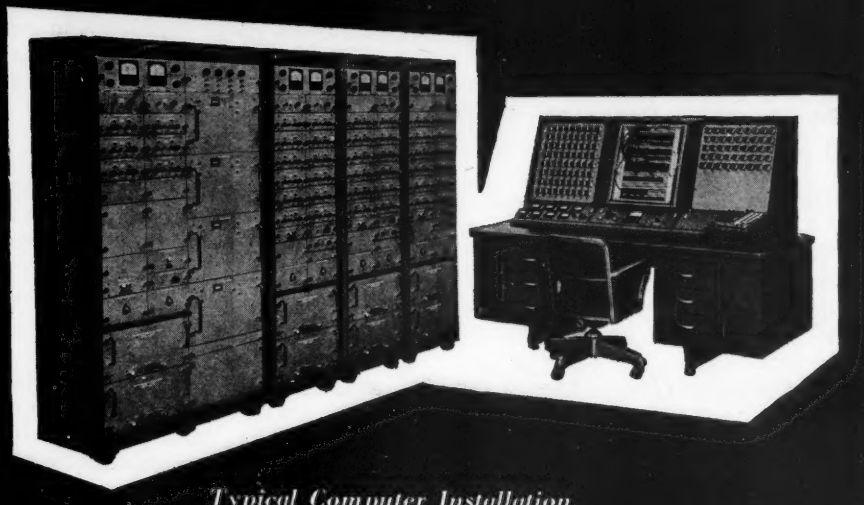

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- A new high quality patch board assembly, using an 1800 position pin patch panel made of metal to avoid leakages between terminals and to improve overall computer accuracy.
- All computing resistors and capacitors contained in an oven to maintain them at a constant temperature to insure reliable and accurate performance.
- Centralized operation of the entire computer from a control console providing maximum ease of operation and flexibility in the use of the system plus minimizing the cost of expansion.

ELECTRONIC ASSOCIATES *Incorporated*

Long Branch, New Jersey

Send for complete data

From: Edmund C. Berkeley and Associates
Publishers of COMPUTERS AND AUTOMATION
36 West 11 St., New York 11, N. Y.

ADVERTISING

1. What is "COMPUTERS AND AUTOMATION"? It is a magazine published monthly, except June and August, containing articles and reference information related to computing machinery, robots, automatic controllers, cybernetics, automation, etc. One important piece of reference information published is the "Roster of Organizations in the Field of Computers and Automation". The basic subscription rate is $4.50 a year in the United States and Canada. Single copies are $1.25. The magazine was called THE COMPUTING MACHINERY FIELD until the March issue; prior to that issue, it was published less often than ten times a year.

2. Who are the logical readers? The logical readers of COMPUTERS AND AUTOMATION are some 3000 persons who are concerned with the field of computers and automation. Many people are entering this field all the time. These include a great number of people who will make recommendations to their organizations about purchasing computing machinery and similar machinery. We have been carefully gathering the names and addresses of these people for some time and believe we can reach them. The print order for the September issue is 1300 copies. The paid subscriptions on June 15, 1953 were a little over 880.

3. What type of advertising does COMPUTERS AND AUTOMATION take? The purpose of the magazine is to be factual and to the point. For this purpose the kind of advertising wanted is the kind that answers questions factually. We recommend for the audience that we reach, that advertising be factual, useful, interesting, understandable, and new from issue to issue. We have had a number of comments expressing satisfaction with our style of advertising.

4. What are the specifications and cost of advertising? The next two issues of COMPUTERS AND AUTOMATION will be in Oct. and Nov., 1953. They will be on pages 8½" by 11" and will be produced by photoffset. If possible, the company advertising should produce final copy, which should be actual size, and may include typing, writing, line drawings, printing, screened half tones, etc. -- any copy that may be photooffset without further preparation. If inconvenient to produce this, we will take rough copy and arrange with the printer to prepare it; there will be small additional charges in this event. Display advertising will be sold in units of full pages (ad size 7" by 10", basic rate $100), and horizontal half pages (ad size 7" by 5", basic rate $55); back cover, $180; inside back cover $125. Classified advertising will be sold by the word (30 cents a word), with a minimum of ten words. The following discounts will apply to display advertising excluding cover space: 20% for a company with less than 50 employees and a publisher of books; 40% for a company of less than 20 employees. The closing date is Sept. 10 for the October issue, and Oct. 10 for the November issue.

5. Who are our advertisers? Our advertisers in seven issues October to July have included the following companies, among others:

Alden Products Co.
Burroughs Adding Machine Co.
Computing Devices of Canada, Limited
Consolidated Engineering Co.
Electronic Associates, Inc.
General Ceramics and Steatite Corp.
Hughes Research and Development Labs.
International Business Machines Corp.
Laboratory for Electronics
The Macmillan Co.
Monroe Calculating Machine Co.
George A. Philbrick Researches, Inc.
Potter Instrument Co.
Reeves Instrument Co.
Remington Rand, Inc.
Sylvania Electric Products, Inc.

MONROBOT ELECTRONIC CALCULATOR

The MONROBOT is a general purpose digital computer, compact, ruggedized, reliable and reasonably priced. In the MONROBOT, decimal numbers are used. Since twenty digits are available, with a centrally located decimal point, there is no need for scaling or setting of decimal point. Neither overflow nor translation techniques are necessary. Orders are written for the calculator in virtually their original algebraic form.

Neither highly trained personnel nor extensive training effort are needed for the MONROBOT. Keyboard and automatic tape operations are counterparts of the simple programming procedures. Average office personnel become familiar with MONROBOT operation the first day. It prints out results on 8-1/2" wide paper roll, or perforates a paper tape as desired.

MONROBOT V is complete in one desk-size unit, ready to plug in and perform. MONROBOTS can be supplied with capacities to suit special requirements, avoiding excess investment for unnecessary facilities.

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MORRIS PLAINS **NEW JERSEY**

A SUBSIDIARY OF MONROE CALCULATING MACHINE COMPANY

PROKAR® miniature molded CAPACITORS

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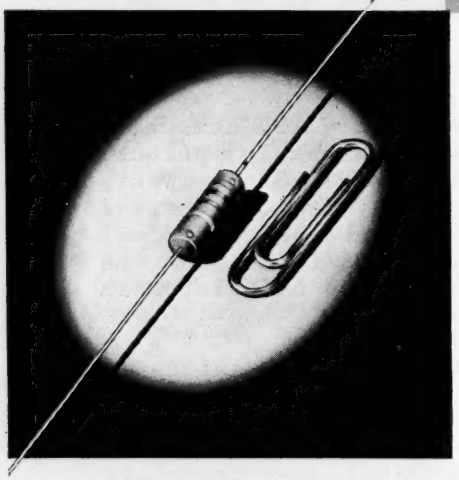

NEW processing developments now make it possible for every Prokar miniature molded capacitor to be used at temperatures up to 125°C without voltage derating! An exclusive Sprague solid dielectric and a mineral-filled phenolic jacket assure stable performance from −55°C to +125°C. Ten mold sizes—ranging upwards from the .175" dia. x 5/8" long unit pictured actual size at left—give you maximum space economy in miniaturized equipments. Originally developed for military uses, the moderate prices of these miniature capacitors make them well worth your investigation also for use in dependable commercial electronic equipment. Write today for Engineering Bulletin 205F to the Sprague Electric Company, 377 Marshall St., North Adams, Massachusetts.

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